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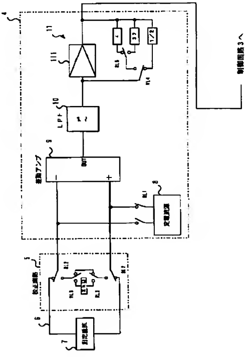
(54)【発明の名称】　通信回線の抵抗測定装置、通信回線の抵抗測定方法、及び記憶媒体

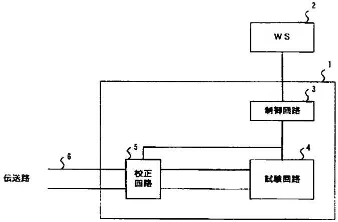
(57)【要約】

【課題】　本発明の課題は、広温度範囲で使用可能な高価な部品を使用することなく、高精度に通信回線の抵抗値を測定する抵抗測定装置及び抵抗測定方法を提供することである。

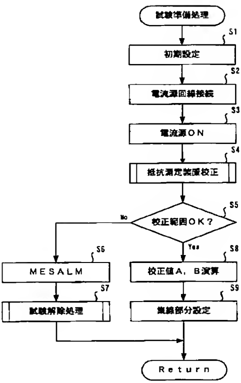
【解決手段】　制御回路３内のＣＰＵ３１は、伝送路６の測定抵抗７の抵抗値を測定する際には、試験準備処理において、校正回路５内の２種類の抵抗を切り替えて接続することにより抵抗測定装置１の校正を行い、それにより取得した校正データが適正範囲内にあるか否か判断する。校正データが適正範囲内にある場合、制御回路３内のＣＰＵ３１は、伝送路６の測定抵抗７の抵抗値を測定してアンプ１１１のレンジを適正なレンジに切り替えて、Ｉ／Ｏ３２によりデジタルデータとして伝送路６の抵抗値データを取得し、校正データが適正範囲内にない場合、伝送路６の測定抵抗７の抵抗値を測定することなく抵抗測定装置測定処理を終了する。



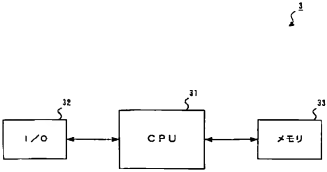
【図１】


2
WS
1
3
制御回路
5
4
6
伝送路
校正
回路
試験回路

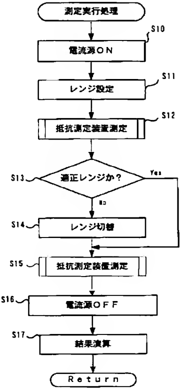
【図４】


試験準備処理
S1
初期設定
S2
電流源回線接続
S3
電流源ON
S4
抵抗測定装置校正
S5
校正範囲OK？
No
Yes
S6
MESALM
S7
試験解除処理
S8
校正値A，B演算
S9
集線部分設定
Return

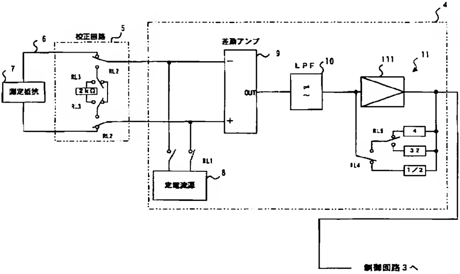
【図２】


3
31
32
33
I／O
CPU
メモリ

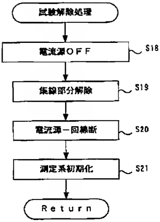
【図５】


測定実行処理
S10
電流源ON
S11
レンジ設定
S12
抵抗測定装置測定
S13
適正レンジか？
Yes
No
S14
レンジ切替
S15
抵抗測定装置測定
S16
電流源OFF
S17
結果演算
Return

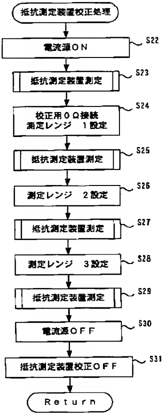
【図３】


4
5
校正回路
6
7
測定抵抗
RL3
RL2
2kΩ
差動アンプ
9
LPF
10
111
11
OUT
RL5
4
32
RL4
1／2
RL1
8
定電流源
制御回路３へ

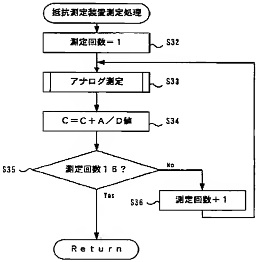
【図６】


試験解除処理
電流源ＯＦＦ
S18
集線部分解除
S19
電流源－回線断
S20
測定系初期化
S21
Ｒｅｔｕｒｎ

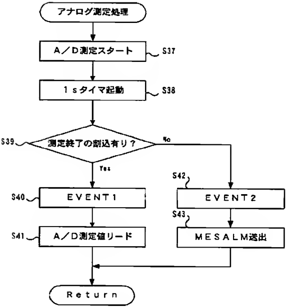
【図７】


抵抗測定装置校正処理
電流源ＯＮ
S22
抵抗測定装置測定
S23
校正用０Ω接続
測定レンジ　１設定
S24
抵抗測定装置測定
S25
測定レンジ　２設定
S26
抵抗測定装置測定
S27
測定レンジ　３設定
S28
抵抗測定装置測定
S29
電流源ＯＦＦ
S30
抵抗測定装置校正ＯＦＦ
S31
Ｒｅｔｕｒｎ

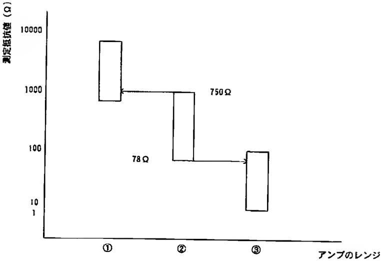
【図８】


抵抗測定装置測定処理
測定回数＝１
S32
アナログ測定
S33
Ｃ＝Ｃ＋Ａ／Ｄ値
S34
S35
測定回数１６？
No
Yes
S36
測定回数＋１
Ｒｅｔｕｒｎ

【図９】


アナログ測定処理
Ａ／Ｄ測定スタート
S37
１ｓタイマ起動
S38
S39
測定終了の割込有り？
No
Yes
S42
S40
ＥＶＥＮＴ１
ＥＶＥＮＴ２
S43
S41
Ａ／Ｄ測定値リード
ＭＥＳＡＬＭ送出
Ｒｅｔｕｒｎ

【図１０】



* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1]A calibration circuit which connects resistance for proofreading of an existing value to a measure resistance circuit, and proofreads a measure resistance circuit.
A measure resistance circuit which measures resistance of a communication line.
A switching circuit which changes said calibration circuit and said communication line to a measure resistance circuit, and is connected.
When it is a measure resistance device of a communication line provided with the above and resistance of said communication line is measured, After proofreading by connecting said calibration circuit to said measure resistance circuit by said switching circuit, it had a control means which connects said communication line to this measure resistance circuit by this switching circuit, and performs measure resistance of this communication line.

[Claim 2]Said control means acquires calibration data at the time of proofreading said measure resistance circuit, When it had further a discriminating means which distinguishes whether this calibration data is in an appropriate range, said calibration data was in a proper time base range by said discriminating means and it is distinguished, A measure resistance device of the communication line according to claim 1 characterized by stopping measure resistance of said communication line by said measure resistance circuit when measure resistance of said communication line by said measure resistance circuit is performed, said calibration data could not be found into a proper time base range by said discriminating means and it is distinguished.
[Claim 3]In a measure resistance method of a communication line characterized by comprising the following, A measure resistance method of a communication line having a control process of changing and controlling each process so that said measure resistance process may be performed after proofreading a measure resistance circuit according to said proofreading

process, when measuring resistance of said communication line.
A proofreading process which connects resistance for proofreading of an existing value to a measure resistance circuit, and proofreads a measure resistance circuit.
A measure resistance process of measuring resistance of a communication line by said measure resistance circuit.

[Claim 4]When calibration data acquired according to said proofreading process was further provided with a discrimination process which distinguishes whether it is in an appropriate range, said control process had said calibration data in a proper time base range according to said discrimination process and it is distinguished, A measure resistance method of the communication line according to claim 3 characterized by stopping said measure resistance process when said measure resistance process is performed, said calibration data could not be found into a proper time base range by said discrimination process and it is distinguished.
[Claim 5]A calibration circuit which connects resistance for proofreading of an existing value to a measure resistance circuit, and proofreads a measure resistance circuit.
A measure resistance circuit which measures resistance of a communication line.
A switching circuit which changes said calibration circuit and said communication line to a measure resistance circuit, and is connected.
When it is the storage provided with the above and resistance of said communication line is measured, A program code which can perform a computer for performing measurement-setup processing which connects said calibration circuit to said measure resistance circuit by said switching circuit, and proofreads a measure resistance circuit, A program containing a program code which can perform a computer for connecting said communication line to said measure resistance circuit by said switching circuit, and performing measure resistance processing of this communication line was stored.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]This invention relates to a measure resistance device and the measure resistance method, and relates to the measure resistance device and the measure resistance method of measuring the resistance of a circuit at the time of opening of traffic of a communication line, and maintenance in detail.
[0002]
[Description of the Prior Art]When the resistance of a communication line was measured conventionally, the reference resistance (0ohmand2komega) in a calibration circuit was measured on the periodic target (every [for example,] 24 hours), this measured value was held as calibration data, and the measured value of the communication line surveyed with this held calibration data was proofread.
[0003]If directions of measure resistance come by the measuring method of the resistance of this communication line from an upper device (WS), the resistance of a communication line is actually measured, using the calibration data currently held, the resistance of a testing circuit will be proofread and the measurement result of the resistance of a communication line will be searched for.
[0004]
[Problem(s) to be Solved by the Invention]However, in the measuring method of the resistance of the conventional communication line, in the time of actually measuring the resistance of a communication line with the time of acquiring calibration data, in order to acquire calibration data periodically, since there was a time lag, when the surrounding temperature change etc. occurred, the error of measurement had arisen in the measured value of the communication line.
[0005]For this reason, in the former, even if there was change of environment, such as a

temperature change, it was highly precise and needed to use the parts of the wide temperature range so that the accuracy of measurement could be satisfied, but. Usable parts are expensive in this wide temperature range, and there was also a problem that cost cost dearly as the whole system, by using such parts.
[0006]The technical problem of this invention is providing the measure resistance device and the measure resistance method of measuring the resistance of a communication line with high precision, without using such expensive parts.
[0007]
[Means for Solving the Problem]In order to solve an aforementioned problem, the invention according to claim 1, A calibration circuit (for example, calibration circuit 5) which connects resistance for proofreading of an existing value to a measure resistance circuit, and proofreads a measure resistance circuit, A measure resistance circuit (for example, the constant current source circuit 8, the differential amplifier 9, the Robus filter 10, and the ranging machine 11 in the testing circuit 4) which measures resistance of a communication line, In a measure resistance device of a communication line provided with a switching circuit (for example, relay RL2 in the calibration circuit 5, RL3) which changes said calibration circuit and said communication line to a measure resistance circuit, and is connected, When measuring resistance of said communication line, after proofreading by connecting said calibration circuit to said measure resistance circuit by said switching circuit, It is characterized by having a control means (for example, step S4 in an examination preliminary treatment of drawing 4 which CPU31 performs and Step S15 in measurement executive operation of drawing 5) which connects said communication line to this measure resistance circuit by this switching circuit, and performs measure resistance of this communication line.
[0008]A calibration circuit which according to this invention according to claim 1 connects resistance for proofreading of an existing value to a measure resistance circuit, and proofreads a measure resistance circuit, In a measure resistance device of a communication line provided with a switching circuit which changes a measure resistance circuit which measures resistance of a communication line, said calibration circuit, and said communication line to a measure resistance circuit, and is connected, When a control means measures resistance of said communication line, after it proofreads by connecting said calibration circuit to said measure resistance circuit by said switching circuit, it connects said communication line to this measure resistance circuit by this switching circuit, and performs measure resistance of this communication line.
[0009]A proofreading process which the invention according to claim 3 connects resistance for proofreading of an existing value to a measure resistance circuit, and proofreads a measure resistance circuit, In a measure resistance method of a communication line provided with a measure resistance process of measuring resistance of a communication line by said measure

resistance circuit, When measuring resistance of said communication line, after proofreading a measure resistance circuit according to said proofreading process, it is characterized by having a control process of changing and controlling each process so that said measure resistance process may be performed.
[0010]A proofreading process which according to this invention according to claim 3 connects resistance for proofreading of an existing value to a measure resistance circuit, and proofreads a measure resistance circuit, In a measure resistance method of a communication line which it had, a measure resistance process of measuring resistance of a communication line by said measure resistance circuit a control process, When measuring resistance of said communication line, after proofreading a measure resistance circuit according to said proofreading process, each process is changed and controlled to perform said measure resistance process.
[0011]A calibration circuit which the storage according to claim 5 connects resistance for proofreading of an existing value to a measure resistance circuit, and proofreads a measure resistance circuit, A switching circuit which changes a measure resistance circuit which measures resistance of a communication line, said calibration circuit, and said communication line to a measure resistance circuit, and is connected, It is the storage which stored a program which can perform a computer for performing measure resistance processing of said communication line by a measure resistance device of preparation **********, Measurement-setup processing which connects said calibration circuit to said measure resistance circuit by said switching circuit, and proofreads a measure resistance circuit when measuring resistance of said communication line. A program code which can perform a computer for performing (for example, an examination preliminary treatment which CPU31 performs), It is characterized by storing a program containing a program code which can perform a computer for connecting said communication line to said measure resistance circuit by said switching circuit, and performing measure resistance processing (for example, measurement executive operation which CPU31 performs) of this communication line.
[0012]A calibration circuit which according to this storage according to claim 5 connects resistance for proofreading of an existing value to a measure resistance circuit, and proofreads a measure resistance circuit, A switching circuit which changes a measure resistance circuit which measures resistance of a communication line, said calibration circuit, and said communication line to a measure resistance circuit, and is connected, By being the storage which stored a program which can perform a computer for performing measure resistance processing of said communication line by a measure resistance device of preparation **********, and executing a program stored in this storage, A computer (for example, CPU31 of the control circuit 3), When measuring resistance of said communication line, measurement-setup processing which connects said calibration circuit to said measure resistance circuit by

said switching circuit, and proofreads a measure resistance circuit is performed, said communication line is connected to said measure resistance circuit by said switching circuit, and measure resistance processing of this communication line is performed.
[0013]Therefore, it writes with measuring resistance of a communication line by this claim 1, claim 3, and the invention according to claim 5, after proofreading a measure resistance circuit when measuring resistance of a communication line, There is no gap of time at the time of calibration data acquisition and actual measurement, it stops producing an error of measurement by the surrounding temperature change etc., and resistance of a communication line can be measured with high precision.
[0014]It is highly precise and it is not necessary to use parts of a wide temperature range, and like before, since a system in consideration of environmental variations, such as a temperature change, which does not use such expensive parts can be built, cost is reducible as the whole system.
[0015]In a measure resistance device of the communication line according to claim 1, the invention according to claim 2 said control means, A discriminating means which distinguishes whether this calibration data is in an appropriate range by acquiring calibration data at the time of proofreading said measure resistance circuit. When it had further (for example, the step S5 in an examination preliminary treatment of drawing 4 which CPU31 performs), said calibration data was in a proper time base range by said discriminating means and it is distinguished, When measure resistance of said communication line by said measure resistance circuit was performed (for example, step S15 in measurement executive operation of drawing 5 which CPU31 performs), said calibration data could not be found into a proper time base range by said discriminating means and it is distinguished, The feature of what (for example, test release processing of drawing 6 which CPU31 performs) measure resistance of said communication line by said measure resistance circuit is stopped for is carried out.
[0016]According to this invention according to claim 2, in a measure resistance device of the communication line according to claim 1 a discriminating means, When calibration data at the time of proofreading said measure resistance circuit was acquired in said control means, it distinguished whether this calibration data would be in an appropriate range, said calibration data was in a proper time base range by said discriminating means and it is distinguished, When measure resistance of said communication line by said measure resistance circuit is performed, said calibration data could not be found into a proper time base range by said discriminating means and it is distinguished, measure resistance of said communication line by said measure resistance circuit is stopped.
[0017]In a measure resistance method of the communication line according to claim 3, the invention according to claim 4 said control process, When calibration data acquired according to said proofreading process was further provided with a discrimination process which

distinguishes whether it is in an appropriate range, said calibration data was in a proper time base range according to said discrimination process and it is distinguished, When said measure resistance process is performed, said calibration data could not be found into a proper time base range by said discrimination process and it is distinguished, it is characterized by stopping said measure resistance process.

[0018]According to this invention according to claim 4, in a measure resistance method of the communication line according to claim 3 a discrimination process, When calibration data acquired according to said proofreading process distinguished whether it would be in an appropriate range in said control process, said calibration data was in a proper time base range according to said discrimination process and it is distinguished, When said measure resistance process is performed, said calibration data could not be found into a proper time base range by said discrimination process and it is distinguished, it is characterized by stopping said measure resistance process.

[0019]Therefore, abnormalities in a measure resistance device of a communication line are detectable by stopping measure resistance and not measuring resistance by this claim 2 and invention according to claim 4, when it can distinguish and is not able to proofread properly, whether a measure resistance circuit has been proofread properly and.

[0020]

[Embodiment of the Invention]Hereafter, the 1 embodiment of the measure resistance method of the communication line which starts this invention with reference to drawing 1 - drawing 10 is described in detail. Composition is explained first.

[0021]Drawing 1 is a figure showing the important section composition of the measure resistance device of a communication line. In this drawing 1, the workstation (henceforth "WS:Work Station") 2 is connected to the measure resistance device 1, and the measure resistance device 1 is connected to the transmission line 6.

[0022]When WS2 communicates via an analog telephone system and an ISDN system network, Although it has a function as OPS (Operation System) for controlling the member accommodation module which bears member accommodation and a line concentration function, and the circuit treatment module which bears a switching function, This embodiment explains the following composition as what bears control when measuring resistance of the transmission line 6 using the measure resistance device 1 which carries out measure resistance of the communication line concerning this invention.

[0023]As the measure resistance device 1 is shown in drawing 1, the important section is constituted by the control circuit 3, the testing circuit 4, and the calibration circuit 5, and the details are circuitry as shown in drawing 3.

[0024]According to the measure resistance directions from WS2, the control circuit 3 proofreads the measure resistance device 1 using the calibration circuit 5, and measures

resistance of the transmission line 6 by the testing circuit 4. As the control circuit 3 is shown in drawing 2, the important section comprises CPU31, I/O32, and the memory 33.
[0025]CPU(Central Processing Unit) 31, When measuring resistance of the transmission line 6, the application program specified out of the system program stored in the memory 33 and the various application programs corresponding to the system concerned is developed to the program storage area in the memory 33 which is not illustrated, Various processing is performed according to the application program which stored temporarily the various directions or data inputted from WS2 in the memory 33, and was stored in the memory 33 according to this input directions and input data, and that processing result is stored in the memory 33.
[0026]When CPU31 measures resistance of the transmission line 6 and the test preparation command from WS2 is received, it performs the examination preliminary treatment mentioned later, sets up a system of measurement, and answers WS2. Subsequently, when a measurement execute command is received from WS2, measurement executive operation mentioned later is performed and the measurement result is outputted to WS2. And when WS2 blank-test release command is received, test release processing mentioned later is performed and WS2 is answered.
[0027]CPU31 judges whether the measure resistance device 1 is proofread and calibration data is in an appropriate range, and if calibration data is in an appropriate range, it will change the range of the amplifier 111 which measures and mentions resistance of the transmission line 6 later to a proper range. And calibration data and the measured resistance value data of the transmission line 6 are stored in the memory 33. [0028]I/O(Input/output) 32, According to the proofreading instruction of the measure resistance device 1 and the measure resistance directions of the transmission line 6 which are inputted from WS2, When the A/D conversion of calibration data when the measure resistance device 1 proofreads by a calibration circuit or resistance of the transmission line 6 is measured, and the measured resistance value data of the transmission line 6 is acquired and carried out, and it outputs to CPU31 and the data is inputted from CPU31, it outputs to WS2.
[0029]When memory (Memory)33 executes [CPU31] the various above-mentioned application programs, while forming the program storage area which develops various data, The memory area for developing the various processing results (calibration data, resistance measurement, etc.) after CPU31 performs each above-mentioned processing is formed.
[0030]The various above-mentioned application programs, various data, etc. are memorized beforehand, and the memory 33 comprises that this memory 33 is magnetic, an optical storage medium, or semiconductor memory. And the memory 33 memorizes the data of the calibration data of the above-mentioned system program, various application programs, and the measure resistance device 1 processed with each processing program, the resistance value data of the transmission line 6, etc.

[0031]As shown in drawing 3, the testing circuit 4 is constituted by the constant current source circuit 8, the differential amplifier 9, the low pass filter (LPF:Low Pass Filter) 10, and ranging machine 11 grade, proofreads the measure resistance device 1, and has a function which measures resistance of the transmission line 6. And the testing circuit 4 outputs the calibration data obtained as the above-mentioned proofreading and a measurement result, and the resistance value data of the transmission line 6 to CPU31 via I/O32 in the control circuit 3.
[0032]As shown in drawing 3, the calibration circuit 5 by changing resistance of 2komega or 0 ohm of resistance (switch-on), and the measuring resistance 7 of the transmission line 6 to the testing circuit 4 by relay RL2 and RL3, and connecting by the inside, It is a circuit for performing offset proofreading and the Spahn proofreading of the measure resistance device 1.
[0033]The constant current source circuit 8 supplies the calibration circuit 5 or measuring resistance 7 constant current, and the differential amplifier 9 outputs each voltage when current is sent through two kinds of resistance in the calibration circuit 5, or the measuring resistance 7 to the low pass filter 10. When the output of the differential amplifier 9 inputs into the low pass filter 10, the low pass filter 10, A dc component is outputted to I/O32 in the control circuit 3 via the ranging machine 11, and I/O32 changes into digital data the analog-currents signal inputted from the ranging machine 11, and outputs it to CPU31 in the control circuit 3.
[0034]The ranging machine 11 has the proper range which changed relay RL4 and RL5, changed the amplification factor of the amplifier 111, and suited the resistance of the measuring resistance 7 with the directions from CPU31 in the control circuit 3 from three kinds of measurement ranges (resistance ratio: 4, 32, 1/2) chosen.
[0035]The range of the measurable resistance of the measurement range set up with the ranging machine 11, For example, they are not less than 750ohms shown in range ** by the resistance ratio 1/2 (amplification factor: twice) as shown in drawing 10 and 78ohm-750ohm shown in range ** by the resistance ratio 4 (amplification factor: 1/4 time), and 10ohm-78ohm shown in range ** by the resistance ratio 32 (amplification factor: 1/32).
[0036]Next, operation of this embodiment is explained using drawing 4 - drawing 9. Drawing 4 is a flow chart which shows the examination preliminary treatment performed before the measure resistance of the transmission line 6. If measure resistance directions of the transmission line 6 are inputted from WS, CPU31 of the control circuit 3 will perform various initial setting in the measure resistance device 1 (Step S1). In this initial setting, the ranging machine 11 is set as range ** (twice as many amplification factor as this) by relay RL4, and resistance of internal 2komega is connected to the testing circuit 4 by relay RL2 and RL3 in the calibration circuit 5.
[0037]CPU31 in the control circuit 3 connects the output stage of the constant current source circuit 8 by relay RL1 to the testing circuit 4 (Step S2), and turns on the power supply of the

constant current source circuit 8 (Step S3). And CPU31 starts the measure resistance device calibration processing (refer to drawing 7) mentioned later (step S4).
[0038]After ending the measure resistance device calibration processing mentioned later, in Step S5, CPU31 in the control circuit 3 judges whether the calibration data acquired by measure resistance device calibration processing is in proofreading within the limits. And when it is in proofreading within the limits, it shifts to Step S8, and when there is nothing to proofreading within the limits, it shifts to Step S6.
[0039]When there is no calibration data which carried out proofreading processing of this measure resistance device 1 in proofreading within the limits, CPU31 in the control circuit 3 ends (Step S7) and an examination preliminary treatment, after performing test release processing (refer to drawing 6) which gives the alert for and (Step S6) mentions measurement impossible alarm (MESALM) later to WS2 via I/O32.
[0040]On the other hand, when the calibration data which carried out proofreading processing of this measure resistance device 1 is in proofreading within the limits. CPU31 in the control circuit 3 calculates the calibration value A and B parameter for proofreading the resistance measurement of the measuring resistance 7 of the transmission line 6 (Step S8), sets up a line concentration portion (step S9), and ends an examination preliminary treatment.
[0041]The measurement executive operation for actually measuring resistance of the transmission line 6 next, if CPU31 in the control circuit 3 answers WS2 in the end of an examination preliminary treatment via I/O32 after an examination preliminary treatment is proofreading within the limits and is completed, and the measurement execute command from WS2 is received via I/O32 is started.
[0042]Drawing 5 is a flow chart which shows measurement executive operation. If a measurement execute command is received via I/O32 from WS2, CPU31 in the control circuit 3 will start measurement executive operation next.
[0043]CPU31 in the control circuit 3 will connect the constant current source circuit 8 to the measuring resistance 7 of the transmission line 6 by relay RL1, if measurement executive operation is started (Step S10). And the range of the ranging machine 11 is set as ** (twice as many amplification factor as this) by relay RL4 (Step S11), and whether it is appropriate that the ranging machine 11 chooses which range and in order to judge, the measure resistance device measuring process mentioned later is performed (Step S12).
[0044]In Step S13, CPU31 in the control circuit 3 judges whether it is proper range within the limits of range ** which the resistance value data of the measuring resistance 7 of the transmission line 6 measured by the measure resistance device measuring process set up by initial setting (Step S1) of the examination preliminary treatment. If the resistance value data of the measuring resistance 7 of the transmission line 6 is not in an appropriate range, CPU31 in the control circuit 3 will change the ranging machine 11 to a range (** or **) suitable for the

resistance value data of the measuring resistance 7 of the transmission line 6 by relay RL4 and RL5 (Step S14).

[0045]Thus, after choosing a proper range, CPU31 in the control circuit 3 performs again the measure resistance device measuring process mentioned later, and acquires the resistance value data of the measuring resistance 7 of the transmission line 6 (Step S15).

[0046]When it finishes acquiring the resistance value data of the measuring resistance 7 of the transmission line 6, CPU31 in the control circuit 3, The resistance value data of the actual transmission line 6 is calculated from the resistance value data and calibration data of the measuring resistance 7 of the transmission line 6 by turning off the power supply of the constant current source circuit 8 (Step S16), and executing the predetermined arithmetic processing program memorized in the memory 33 (Step S17).

[0047]CPU31 in the control circuit 3 saves the result of an operation of the resistance value data of the transmission line 6 in the predetermined preservation destination in the memory 33 while developing to the memory area of the memory 33. Then, CPU31 in the control circuit 3 ends measurement executive operation, and transmits the result of an operation of the resistance value data of the transmission line 6 stored in the memory 33 to WS2 via I/O32.

[0048]Drawing 6 is a flow chart which shows the test release processing which CPU31 in the control circuit 3 performs.

[0049]When the measure resistance device 1 is not settled in the proofreading range in Step S6 under examination preliminary treatment (refer to drawing 4), CPU31 in the control circuit 3, If WS2 is alerted for measurement impossible alarm (MESALM) via I/O32 (Step S7) and the test release processing command from WS2 is received via I/O32, test release processing will be started (Step S7). If test release processing is started, CPU31 in the control circuit 3 turns off the power supply of the constant current source circuit 8 (Step S18).

[0050]And CPU31 in the control circuit 3 cancels a line concentration portion (Step S19), cuts connection between the circuits of the constant current source circuit 8 and the transmission line 6 by relay RL1 (Step S20), and initializes system-of-measurement setting out in the measure resistance device 1 (Step S25). By initialization of setting out of this system of measurement, the ranging machine 11 is set as range ** by relay RL4. Then, test release processing is completed, and the measure resistance device 1 also ends an examination preliminary treatment without being proofread.

[0051]Drawing 7 is a flow chart which shows the measure resistance device calibration processing which CPU31 in the control circuit 3 performs.

[0052]In step S4 under examination preliminary treatment (refer to drawing 4), if measure resistance device calibration processing is started, CPU31 in the control circuit 3 turns on the power supply of the constant current source circuit 8 (Step S22).

[0053]And CPU31 in the control circuit 3 performs the measure resistance device measuring

process later mentioned when the resistance in the calibration circuit 5 is connected to 2komega (Step S23).

[0054]Subsequently, after CPU31 sets resistance in the calibration circuit 5 to 0 ohm (switch-on) and setting the measurement range in the ranging machine 11 as ** (amplification factor: twice) (Step S24), the measure resistance device measuring process mentioned later is performed (Step S25).

[0055]After CPU31 sets the measurement range in the ranging machine 11 as ** (amplification factor: 1/4 time) (Step S26), it performs the measure resistance device measuring process mentioned later (Step S27), and makes it the same, After setting the measurement range in the ranging machine 11 as ** (amplification factor: 1/32 time) (Step S28), the measure resistance device measuring process mentioned later is performed (Step S29).

[0056]As mentioned above, since a measurement range can be changed by relay RL4 in the ranging machine 11, and RL5 to 0 ohm (switch-on) of resistance in the calibration circuit 5, a measure resistance device measuring process can be performed and a total of four kinds of measurement results can be obtained, The measure resistance device 1 can be more correctly proofread by using these calibration data.

[0057]After finishing four above-mentioned measure resistance device measuring processes, CPU31 in the control circuit 3 turns off the power supply of the constant current source circuit 8 (Step S30), turns off a measure resistance device calibration (Step S31), and ends measure resistance device calibration processing.

[0058]Drawing 8 is a showing [the measure resistance device measuring process performed in measurement executive operation and measure resistance device calibration processing] flow chart.

[0059]If a measure resistance device measuring process is started, CPU31 in the control circuit 3 will input "1" into the measurement count of the program storage area in the memory 33 (Step S32).

[0060]And CPU31 in the control circuit 3 performs the analog measuring process mentioned later, The analog measured value signal accompanying the measure resistance of the transmission line 6 is acquired from I/O32 in the control circuit 3 as A/D measured value (Step S33), and C=C+A/D value is calculated to counted value C (Step S34).

[0061]In Step S35, CPU31 in the control circuit 3 shifts to Step S36, when judging whether the measurement count became 16 times and it is less than 16 times yet, and it performs the analog measuring process which returns to Step S33 and mentions a measurement count later similarly after adding 1 to the original measurement count. CPU31 in the control circuit 3 repeats the same processing, and when a measurement count becomes 16 times, it ends a measure resistance device measuring process.

[0062]Thus, the value of called-for C changes into digital data the analog data produced by

measuring resistance of the transmission line 6 a total of 16 times by I/O32 in the control circuit 3, and totals A/D value which is the value.

[0063]Drawing 9 is a flow chart which shows the analog measuring process in Step S33 of a measure resistance device measuring process.

[0064]If an analog measuring process is started, CPU31 in the control circuit 3 will start A/D measurement (Step S37), and will start the timer for 1 s (Step S38).

[0065]In Step S46, CPU31 in the control circuit 3 judges whether there was any interrupt signal of measuring finish, while the timer for 1 s has started. When there is an interrupt signal of measuring finish, it shifts to Step S40, EVENT1 is performed, and A/D measured value is led (Step S41). moreover -- shifting to Step S42 and performing EVENT2, when there is no interrupt signal of measuring finish -- the time of proofreading -- measurement impossible alarm (MESALM) -- at the time of an examination (at the time of measurement execution), WS2 is alerted for the alarm of an abnormal occurrence via I/O32 during measurement (Step S43). Then, CPU31 in the control circuit 3 ends an analog measuring process.

[0066]As mentioned above, in this embodiment, after acquiring calibration data, we decided to measure the resistance of the measuring resistance 7 of the transmission line 6 continuously, and the composition which it is not related at the time of measurement execution, and acquires calibration data on a periodic target (every [for example,] 24 hours) did not carry out the resistance of the measuring resistance 7 of the transmission line 6.

[0067]Since the time at the time of calibration data acquisition and the measure resistance of the actual transmission line 6 stops shifting by this when measuring the resistance of the measuring resistance 7 of the transmission line 6, it stops producing the error of measurement by the surrounding temperature change etc., and resistance of the transmission line 6 can be measured with high precision.

[0068]Since the system in consideration of environmental variations, such as a temperature change, which is highly precise, and it becomes unnecessary to use the parts of a wide temperature range, and does not use such expensive parts can be built like before, cost is reducible as the whole system.

[0069]When calibration data is acquired, and it distinguishes whether the calibration data is in an appropriate range and there is nothing into an appropriate range, The abnormalities in the transmission line 6 or the measure resistance device 1 are detectable by writing with stopping measurement of the resistance of the measuring resistance 7 of the transmission line 6, and being unable to acquire resistance value data in this case. Thereby, resistance of a communication line can be measured with high precision.

[0070]

[Effect of the Invention]It writes with measuring resistance of a communication line, after proofreading a measure resistance circuit when measuring resistance of a communication line

according to claim 1, claim 3, and the invention according to claim 5, There is no gap of the time at the time of calibration data acquisition and actual measurement, it stops producing the error of measurement by the surrounding temperature change etc., and resistance of a communication line can be measured with high precision.

[0071]It is highly precise and it is not necessary to use the parts of a wide temperature range, and like before, since the system in consideration of environmental variations, such as a temperature change, which does not use such expensive parts can be built, cost is reducible as the whole system.

[0072]According to claim 2 and the invention according to claim 4, the abnormalities in the measure resistance device of a communication line are detectable whether the measure resistance circuit has been proofread properly and by stopping measure resistance and not measuring resistance of a communication line, when it can distinguish and is not able to proofread properly.

[Translation done.]

TECHNICAL FIELD

[Field of the Invention]This invention relates to a measure resistance device and the measure resistance method, and relates to the measure resistance device and the measure resistance method of measuring the resistance of a circuit at the time of opening of traffic of a communication line, and maintenance in detail.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

PRIOR ART

[Description of the Prior Art]When the resistance of a communication line was measured conventionally, the reference resistance (0ohmand2komega) in a calibration circuit was measured on the periodic target (every [for example,] 24 hours), this measured value was held as calibration data, and the measured value of the communication line surveyed with this held calibration data was proofread.
[0003]If directions of measure resistance come by the measuring method of the resistance of this communication line from an upper device (WS), the resistance of a communication line is actually measured, using the calibration data currently held, the resistance of a testing circuit will be proofread and the measurement result of the resistance of a communication line will be searched for.

[Translation done.]

EFFECT OF THE INVENTION

[Effect of the Invention]It writes with measuring resistance of a communication line, after proofreading a measure resistance circuit when measuring resistance of a communication line according to claim 1, claim 3, and the invention according to claim 5, There is no gap of the time at the time of calibration data acquisition and actual measurement, it stops producing the error of measurement by the surrounding temperature change etc., and resistance of a communication line can be measured with high precision.
[0071]It is highly precise and it is not necessary to use the parts of a wide temperature range, and like before, since the system in consideration of environmental variations, such as a temperature change, which does not use such expensive parts can be built, cost is reducible as the whole system.
[0072]According to claim 2 and the invention according to claim 4, the abnormalities in the measure resistance device of a communication line are detectable whether the measure resistance circuit has been proofread properly and by stopping measure resistance and not measuring resistance of a communication line, when it can distinguish and is not able to proofread properly.

[Translation done.]

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention]However, in the measuring method of the resistance of the conventional communication line, in the time of actually measuring the resistance of a communication line with the time of acquiring calibration data, in order to acquire calibration data periodically, since there was a time lag, when the surrounding temperature change etc. occurred, the error of measurement had arisen in the measured value of the communication line.
[0005]For this reason, in the former, even if there was change of environment, such as a temperature change, it was highly precise and needed to use the parts of the wide temperature range so that the accuracy of measurement could be satisfied, but. Usable parts are expensive in this wide temperature range, and there was also a problem that cost cost dearly as the whole system, by using such parts.
[0006]The technical problem of this invention is providing the measure resistance device and the measure resistance method of measuring the resistance of a communication line with high precision, without using such expensive parts.

[Translation done.]

* NOTICES *

MEANS

[Means for Solving the Problem]In order to solve an aforementioned problem, the invention according to claim 1, A calibration circuit (for example, calibration circuit 5) which connects resistance for proofreading of an existing value to a measure resistance circuit, and proofreads a measure resistance circuit, A measure resistance circuit (for example, the constant current source circuit 8, the differential amplifier 9, the Robus filter 10, and the ranging machine 11 in the testing circuit 4) which measures resistance of a communication line, In a measure resistance device of a communication line provided with a switching circuit (for example, relay RL2 in the calibration circuit 5, RL3) which changes said calibration circuit and said communication line to a measure resistance circuit, and is connected, When measuring resistance of said communication line, after proofreading by connecting said calibration circuit to said measure resistance circuit by said switching circuit, It is characterized by having a control means (for example, step S4 in an examination preliminary treatment of drawing 4 which CPU31 performs and Step S15 in measurement executive operation of drawing 5) which connects said communication line to this measure resistance circuit by this switching circuit, and performs measure resistance of this communication line.
[0008]A calibration circuit which according to this invention according to claim 1 connects resistance for proofreading of an existing value to a measure resistance circuit, and proofreads a measure resistance circuit, In a measure resistance device of a communication line provided with a switching circuit which changes a measure resistance circuit which measures resistance of a communication line. said calibration circuit, and said communication line to a measure resistance circuit, and is connected, When a control means measures resistance of said communication line, after it proofreads by connecting said calibration circuit to said measure resistance circuit by said switching circuit, it connects said communication line to this measure resistance circuit by this switching circuit, and performs measure resistance of this communication line.

[0009]A proofreading process which the invention according to claim 3 connects resistance for proofreading of an existing value to a measure resistance circuit, and proofreads a measure resistance circuit, In a measure resistance method of a communication line provided with a measure resistance process of measuring resistance of a communication line by said measure resistance circuit. When measuring resistance of said communication line, after proofreading a measure resistance circuit according to said proofreading process, it is characterized by having a control process of changing and controlling each process so that said measure resistance process may be performed.
[0010]A proofreading process which according to this invention according to claim 3 connects resistance for proofreading of an existing value to a measure resistance circuit, and proofreads a measure resistance circuit, In a measure resistance method of a communication line which it had, a measure resistance process of measuring resistance of a communication line by said measure resistance circuit a control process, When measuring resistance of said communication line, after proofreading a measure resistance circuit according to said proofreading process, each process is changed and controlled to perform said measure resistance process.
[0011]A calibration circuit which the storage according to claim 5 connects resistance for proofreading of an existing value to a measure resistance circuit, and proofreads a measure resistance circuit, A switching circuit which changes a measure resistance circuit which measures resistance of a communication line, said calibration circuit, and said communication line to a measure resistance circuit, and is connected, It is the storage which stored a program which can perform a computer for performing measure resistance processing of said communication line by a measure resistance device of preparation **********, Measurement-setup processing which connects said calibration circuit to said measure resistance circuit by said switching circuit, and proofreads a measure resistance circuit when measuring resistance of said communication line. A program code which can perform a computer for performing (for example, an examination preliminary treatment which CPU31 performs), It is characterized by storing a program containing a program code which can perform a computer for connecting said communication line to said measure resistance circuit by said switching circuit, and performing measure resistance processing (for example, measurement executive operation which CPU31 performs) of this communication line.
[0012]A calibration circuit which according to this storage according to claim 5 connects resistance for proofreading of an existing value to a measure resistance circuit, and proofreads a measure resistance circuit, A switching circuit which changes a measure resistance circuit which measures resistance of a communication line, said calibration circuit, and said communication line to a measure resistance circuit, and is connected, By being the storage which stored a program which can perform a computer for performing measure resistance

processing of said communication line by a measure resistance device of preparation **********, and executing a program stored in this storage, A computer (for example, CPU31 of the control circuit 3), When measuring resistance of said communication line, measurement-setup processing which connects said calibration circuit to said measure resistance circuit by said switching circuit, and proofreads a measure resistance circuit is performed, said communication line is connected to said measure resistance circuit by said switching circuit, and measure resistance processing of this communication line is performed.
[0013]Therefore, it writes with measuring resistance of a communication line by this claim 1, claim 3, and the invention according to claim 5, after proofreading a measure resistance circuit when measuring resistance of a communication line, There is no gap of time at the time of calibration data acquisition and actual measurement, it stops producing an error of measurement by the surrounding temperature change etc., and resistance of a communication line can be measured with high precision.
[0014]It is highly precise and it is not necessary to use parts of a wide temperature range, and like before, since a system in consideration of environmental variations, such as a temperature change, which does not use such expensive parts can be built, cost is reducible as the whole system.
[0015]In a measure resistance device of the communication line according to claim 1, the invention according to claim 2 said control means, A discriminating means which distinguishes whether this calibration data is in an appropriate range by acquiring calibration data at the time of proofreading said measure resistance circuit. When it had further (for example, the step S5 in an examination preliminary treatment of drawing 4 which CPU31 performs), said calibration data was in a proper time base range by said discriminating means and it is distinguished, When measure resistance of said communication line by said measure resistance circuit was performed (for example, step S15 in measurement executive operation of drawing 5 which CPU31 performs), said calibration data could not be found into a proper time base range by said discriminating means and it is distinguished, The feature of what (for example, test release processing of drawing 6 which CPU31 performs) measure resistance of said communication line by said measure resistance circuit is stopped for is carried out.
[0016]According to this invention according to claim 2, in a measure resistance device of the communication line according to claim 1 a discriminating means, When calibration data at the time of proofreading said measure resistance circuit was acquired in said control means, it distinguished whether this calibration data would be in an appropriate range, said calibration data was in a proper time base range by said discriminating means and it is distinguished, When measure resistance of said communication line by said measure resistance circuit is performed, said calibration data could not be found into a proper time base range by said discriminating means and it is distinguished, measure resistance of said communication line by

said measure resistance circuit is stopped.

[0017]In a measure resistance method of the communication line according to claim 3, the invention according to claim 4 said control process, When calibration data acquired according to said proofreading process was further provided with a discrimination process which distinguishes whether it is in an appropriate range, said calibration data was in a proper time base range according to said discrimination process and it is distinguished. When said measure resistance process is performed, said calibration data could not be found into a proper time base range by said discrimination process and it is distinguished, it is characterized by stopping said measure resistance process.

[0018]According to this invention according to claim 4, in a measure resistance method of the communication line according to claim 3 a discrimination process, When calibration data acquired according to said proofreading process distinguished whether it would be in an appropriate range in said control process, said calibration data was in a proper time base range according to said discrimination process and it is distinguished, When said measure resistance process is performed, said calibration data could not be found into a proper time base range by said discrimination process and it is distinguished, it is characterized by stopping said measure resistance process.

[0019]Therefore, abnormalities in a measure resistance device of a communication line are detectable by stopping measure resistance and not measuring resistance by this claim 2 and invention according to claim 4, when it can distinguish and is not able to proofread properly, whether a measure resistance circuit has been proofread properly and.

[0020]

[Embodiment of the Invention]Hereafter, the 1 embodiment of the measure resistance method of the communication line which starts this invention with reference to drawing 1 - drawing 10 is described in detail. Composition is explained first.

[0021]Drawing 1 is a figure showing the important section composition of the measure resistance device of a communication line. In this drawing 1, the workstation (henceforth "WS:Work Station") 2 is connected to the measure resistance device 1, and the measure resistance device 1 is connected to the transmission line 6.

[0022]When WS2 communicates via an analog telephone system and an ISDN system network, Although it has a function as OPS (Operation System) for controlling the member accommodation module which bears member accommodation and a line concentration function, and the circuit treatment module which bears a switching function, This embodiment explains the following composition as what bears control when measuring resistance of the transmission line 6 using the measure resistance device 1 which carries out measure resistance of the communication line concerning this invention.

[0023]As the measure resistance device 1 is shown in drawing 1, the important section is

constituted by the control circuit 3, the testing circuit 4, and the calibration circuit 5, and the details are circuitry as shown in drawing 3.

[0024]According to the measure resistance directions from WS2, the control circuit 3 proofreads the measure resistance device 1 using the calibration circuit 5, and measures resistance of the transmission line 6 by the testing circuit 4. As the control circuit 3 is shown in drawing 2, the important section comprises CPU31, I/O32, and the memory 33.

[0025]CPU(Central Processing Unit) 31, When measuring resistance of the transmission line 6, the application program specified out of the system program stored in the memory 33 and the various application programs corresponding to the system concerned is developed to the program storage area in the memory 33 which is not illustrated, Various processing is performed according to the application program which stored temporarily the various directions or data inputted from WS2 in the memory 33, and was stored in the memory 33 according to this input directions and input data, and that processing result is stored in the memory 33.

[0026]When CPU31 measures resistance of the transmission line 6 and the test preparation command from WS2 is received, it performs the examination preliminary treatment mentioned later, sets up a system of measurement, and answers WS2. Subsequently, when a measurement execute command is received from WS2, measurement executive operation mentioned later is performed and the measurement result is outputted to WS2. And when WS2 blank-test release command is received, test release processing mentioned later is performed and WS2 is answered.

[0027]CPU31 judges whether the measure resistance device 1 is proofread and calibration data is in an appropriate range, and if calibration data is in an appropriate range, it will change the range of the amplifier 111 which measures and mentions resistance of the transmission line 6 later to a proper range. And calibration data and the measured resistance value data of the transmission line 6 are stored in the memory 33. [0028]I/O(Input/output) 32, According to the proofreading instruction of the measure resistance device 1 and the measure resistance directions of the transmission line 6 which are inputted from WS2, When the A/D conversion of calibration data when the measure resistance device 1 proofreads by a calibration circuit or resistance of the transmission line 6 is measured, and the measured resistance value data of the transmission line 6 is acquired and carried out, and it outputs to CPU31 and the data is inputted from CPU31, it outputs to WS2.

[0029]When memory (Memory)33 executes [CPU31] the various above-mentioned application programs, while forming the program storage area which develops various data, The memory area for developing the various processing results (calibration data, resistance measurement, etc.) after CPU31 performs each above-mentioned processing is formed.

[0030]The various above-mentioned application programs, various data, etc. are memorized beforehand, and the memory 33 comprises that this memory 33 is magnetic, an optical storage

medium, or semiconductor memory. And the memory 33 memorizes the data of the calibration data of the above-mentioned system program, various application programs, and the measure resistance device 1 processed with each processing program, the resistance value data of the transmission line 6, etc.

[0031]As shown in drawing 3, the testing circuit 4 is constituted by the constant current source circuit 8, the differential amplifier 9, the low pass filter (LPF:Low Pass Filter) 10, and ranging machine 11 grade, proofreads the measure resistance device 1, and has a function which measures resistance of the transmission line 6. And the testing circuit 4 outputs the calibration data obtained as the above-mentioned proofreading and a measurement result, and the resistance value data of the transmission line 6 to CPU31 via I/O32 in the control circuit 3.

[0032]As shown in drawing 3, the calibration circuit 5 by changing resistance of 2komega or 0 ohm of resistance (switch-on), and the measuring resistance 7 of the transmission line 6 to the testing circuit 4 by relay RL2 and RL3, and connecting by the inside, It is a circuit for performing offset proofreading and the Spahn proofreading of the measure resistance device 1.

[0033]The constant current source circuit 8 supplies the calibration circuit 5 or measuring resistance 7 constant current, and the differential amplifier 9 outputs each voltage when current is sent through two kinds of resistance in the calibration circuit 5, or the measuring resistance 7 to the low pass filter 10. When the output of the differential amplifier 9 inputs into the low pass filter 10, the low pass filter 10, A dc component is outputted to I/O32 in the control circuit 3 via the ranging machine 11, and I/O32 changes into digital data the analog-currents signal inputted from the ranging machine 11, and outputs it to CPU31 in the control circuit 3.

[0034]The ranging machine 11 has the proper range which changed relay RL4 and RL5, changed the amplification factor of the amplifier 111, and suited the resistance of the measuring resistance 7 with the directions from CPU31 in the control circuit 3 from three kinds of measurement ranges (resistance ratio: 4, 32, 1/2) chosen.

[0035]The range of the measurable resistance of the measurement range set up with the ranging machine 11, For example, they are not less than 750ohms shown in range ** by the resistance ratio 1/2 (amplification factor: twice) as shown in drawing 10 and 78ohm-750ohm shown in range ** by the resistance ratio 4 (amplification factor: 1/4 time), and 10ohm-78ohm shown in range ** by the resistance ratio 32 (amplification factor: 1/32).

[0036]Next, operation of this embodiment is explained using drawing 4 - drawing 9. Drawing 4 is a flow chart which shows the examination preliminary treatment performed before the measure resistance of the transmission line 6. If measure resistance directions of the transmission line 6 are inputted from WS, CPU31 of the control circuit 3 will perform various initial setting in the measure resistance device 1 (Step S1). In this initial setting, the ranging machine 11 is set as range ** (twice as many amplification factor as this) by relay RL4, and

resistance of internal 2komega is connected to the testing circuit 4 by relay RL2 and RL3 in the calibration circuit 5.

[0037]CPU31 in the control circuit 3 connects the output stage of the constant current source circuit 8 by relay RL1 to the testing circuit 4 (Step S2), and turns on the power supply of the constant current source circuit 8 (Step S3). And CPU31 starts the measure resistance device calibration processing (refer to drawing 7) mentioned later (step S4).

[0038]After ending the measure resistance device calibration processing mentioned later, in Step S5, CPU31 in the control circuit 3 judges whether the calibration data acquired by measure resistance device calibration processing is in proofreading within the limits. And when it is in proofreading within the limits, it shifts to Step S8, and when there is nothing to proofreading within the limits, it shifts to Step S6.

[0039]When there is no calibration data which carried out proofreading processing of this measure resistance device 1 in proofreading within the limits, CPU31 in the control circuit 3 ends (Step S7) and an examination preliminary treatment, after performing test release processing (refer to drawing 6) which gives the alert for and (Step S6) mentions measurement impossible alarm (MESALM) later to WS2 via I/O32.

[0040]On the other hand, when the calibration data which carried out proofreading processing of this measure resistance device 1 is in proofreading within the limits. CPU31 in the control circuit 3 calculates the calibration value A and B parameter for proofreading the resistance measurement of the measuring resistance 7 of the transmission line 6 (Step S8), sets up a line concentration portion (step S9), and ends an examination preliminary treatment.

[0041]The measurement executive operation for actually measuring resistance of the transmission line 6 next, if CPU31 in the control circuit 3 answers WS2 in the end of an examination preliminary treatment via I/O32 after an examination preliminary treatment is proofreading within the limits and is completed, and the measurement execute command from WS2 is received via I/O32 is started.

[0042]Drawing 5 is a flow chart which shows measurement executive operation. If a measurement execute command is received via I/O32 from WS2, CPU31 in the control circuit 3 will start measurement executive operation next.

[0043]CPU31 in the control circuit 3 will connect the constant current source circuit 8 to the measuring resistance 7 of the transmission line 6 by relay RL1, if measurement executive operation is started (Step S10). And the range of the ranging machine 11 is set as ** (twice as many amplification factor as this) by relay RL4 (Step S11), and whether it is appropriate that the ranging machine 11 chooses which range and in order to judge, the measure resistance device measuring process mentioned later is performed (Step S12).

[0044]In Step S13, CPU31 in the control circuit 3 judges whether it is proper range within the limits of range ** which the resistance value data of the measuring resistance 7 of the

transmission line 6 measured by the measure resistance device measuring process set up by initial setting (Step S1) of the examination preliminary treatment. If the resistance value data of the measuring resistance 7 of the transmission line 6 is not in an appropriate range, CPU31 in the control circuit 3 will change the ranging machine 11 to a range (** or **) suitable for the resistance value data of the measuring resistance 7 of the transmission line 6 by relay RL4 and RL5 (Step S14).
[0045]Thus, after choosing a proper range, CPU31 in the control circuit 3 performs again the measure resistance device measuring process mentioned later, and acquires the resistance value data of the measuring resistance 7 of the transmission line 6 (Step S15).
[0046]When it finishes acquiring the resistance value data of the measuring resistance 7 of the transmission line 6, CPU31 in the control circuit 3, The resistance value data of the actual transmission line 6 is calculated from the resistance value data and calibration data of the measuring resistance 7 of the transmission line 6 by turning off the power supply of the constant current source circuit 8 (Step S16), and executing the predetermined arithmetic processing program memorized in the memory 33 (Step S17).
[0047]CPU31 in the control circuit 3 saves the result of an operation of the resistance value data of the transmission line 6 in the predetermined preservation destination in the memory 33 while developing to the memory area of the memory 33. Then, CPU31 in the control circuit 3 ends measurement executive operation, and transmits the result of an operation of the resistance value data of the transmission line 6 stored in the memory 33 to WS2 via I/O32.
[0048]Drawing 6 is a flow chart which shows the test release processing which CPU31 in the control circuit 3 performs.
[0049]When the measure resistance device 1 is not settled in the proofreading range in Step S6 under examination preliminary treatment (refer to drawing 4), CPU31 in the control circuit 3, If WS2 is alerted for measurement impossible alarm (MESALM) via I/O32 (Step S7) and the test release processing command from WS2 is received via I/O32, test release processing will be started (Step S7). If test release processing is started, CPU31 in the control circuit 3 turns off the power supply of the constant current source circuit 8 (Step S18).
[0050]And CPU31 in the control circuit 3 cancels a line concentration portion (Step S19), cuts connection between the circuits of the constant current source circuit 8 and the transmission line 6 by relay RL1 (Step S20), and initializes system-of-measurement setting out in the measure resistance device 1 (Step S25). By initialization of setting out of this system of measurement, the ranging machine 11 is set as range ** by relay RL4. Then, test release processing is completed, and the measure resistance device 1 also ends an examination preliminary treatment without being proofread.
[0051]Drawing 7 is a flow chart which shows the measure resistance device calibration processing which CPU31 in the control circuit 3 performs.

[0052]In step S4 under examination preliminary treatment (refer to drawing 4), if measure resistance device calibration processing is started, CPU31 in the control circuit 3 turns on the power supply of the constant current source circuit 8 (Step S22).
[0053]And CPU31 in the control circuit 3 performs the measure resistance device measuring process later mentioned when the resistance in the calibration circuit 5 is connected to 2komega (Step S23).
[0054]Subsequently, after CPU31 sets resistance in the calibration circuit 5 to 0 ohm (switch-on) and setting the measurement range in the ranging machine 11 as ** (amplification factor: twice) (Step S24), the measure resistance device measuring process mentioned later is performed (Step S25).
[0055]After CPU31 sets the measurement range in the ranging machine 11 as ** (amplification factor: 1/4 time) (Step S26), it performs the measure resistance device measuring process mentioned later (Step S27), and makes it the same, After setting the measurement range in the ranging machine 11 as ** (amplification factor: 1/32 time) (Step S28), the measure resistance device measuring process mentioned later is performed (Step S29).
[0056]As mentioned above, since a measurement range can be changed by relay RL4 in the ranging machine 11, and RL5 to 0 ohm (switch-on) of resistance in the calibration circuit 5, a measure resistance device measuring process can be performed and a total of four kinds of measurement results can be obtained, The measure resistance device 1 can be more correctly proofread by using these calibration data.
[0057]After finishing four above-mentioned measure resistance device measuring processes, CPU31 in the control circuit 3 turns off the power supply of the constant current source circuit 8 (Step S30), turns off a measure resistance device calibration (Step S31), and ends measure resistance device calibration processing.
[0058]Drawing 8 is a showing [the measure resistance device measuring process performed in measurement executive operation and measure resistance device calibration processing] flow chart.
[0059]If a measure resistance device measuring process is started, CPU31 in the control circuit 3 will input "1" into the measurement count of the program storage area in the memory 33 (Step S32).
[0060]And CPU31 in the control circuit 3 performs the analog measuring process mentioned later, The analog measured value signal accompanying the measure resistance of the transmission line 6 is acquired from I/O32 in the control circuit 3 as A/D measured value (Step S33), and C=C+A/D value is calculated to counted value C (Step S34).
[0061]In Step S35, CPU31 in the control circuit 3 shifts to Step S36, when judging whether the measurement count became 16 times and it is less than 16 times yet, and it performs the analog measuring process which returns to Step S33 and mentions a measurement count later

similarly after adding 1 to the original measurement count. CPU31 in the control circuit 3 repeats the same processing, and when a measurement count becomes 16 times, it ends a measure resistance device measuring process.

[0062]Thus, the value of called-for C changes into digital data the analog data produced by measuring resistance of the transmission line 6 a total of 16 times by I/O32 in the control circuit 3, and totals A/D value which is the value.

[0063]Drawing 9 is a flow chart which shows the analog measuring process in Step S33 of a measure resistance device measuring process.

[0064]If an analog measuring process is started, CPU31 in the control circuit 3 will start A/D measurement (Step S37), and will start the timer for 1 s (Step S38).

[0065]In Step S46, CPU31 in the control circuit 3 judges whether there was any interrupt signal of measuring finish, while the timer for 1 s has started. When there is an interrupt signal of measuring finish, it shifts to Step S40, EVENT1 is performed, and A/D measured value is led (Step S41). moreover -- shifting to Step S42 and performing EVENT2, when there is no interrupt signal of measuring finish -- the time of proofreading -- measurement impossible alarm (MESALM) -- at the time of an examination (at the time of measurement execution), WS2 is alerted for the alarm of an abnormal occurrence via I/O32 during measurement (Step S43). Then, CPU31 in the control circuit 3 ends an analog measuring process.

[0066]As mentioned above, in this embodiment, after acquiring calibration data, we decided to measure the resistance of the measuring resistance 7 of the transmission line 6 continuously, and the composition which it is not related at the time of measurement execution, and acquires calibration data on a periodic target (every [for example,] 24 hours) did not carry out the resistance of the measuring resistance 7 of the transmission line 6.

[0067]Since the time at the time of calibration data acquisition and the measure resistance of the actual transmission line 6 stops shifting by this when measuring the resistance of the measuring resistance 7 of the transmission line 6, it stops producing the error of measurement by the surrounding temperature change etc., and resistance of the transmission line 6 can be measured with high precision.

[0068]Since the system in consideration of environmental variations, such as a temperature change, which is highly precise, and it becomes unnecessary to use the parts of a wide temperature range, and does not use such expensive parts can be built like before, cost is reducible as the whole system.

[0069]When calibration data is acquired, and it distinguishes whether the calibration data is in an appropriate range and there is nothing into an appropriate range, The abnormalities in the transmission line 6 or the measure resistance device 1 are detectable by writing with stopping measurement of the resistance of the measuring resistance 7 of the transmission line 6, and being unable to acquire resistance value data in this case. Thereby, resistance of a

communication line can be measured with high precision.

[Translation done.]

* NOTICES *

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2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1]It is a figure showing the circuit tester's 1 important section in the 1 embodiment of this invention.
[Drawing 2]It is a block diagram showing the important section composition of WS2 in the 1 embodiment of this invention.
[Drawing 3]It is a figure showing the internal configuration of the measure resistance device 1 in the 1 embodiment of this invention in detail.
[Drawing 4]It is a figure showing the flow chart of the examination preliminary treatment in the 1 embodiment of this invention.
[Drawing 5]It is a figure showing the flow chart of the measurement executive operation in the 1 embodiment of this invention.
[Drawing 6]It is a figure showing the flow chart of the test release processing in the 1 embodiment of this invention.
[Drawing 7]It is a figure showing the flow chart of the measure resistance device calibration processing in the examination preliminary treatment in the 1 embodiment of this invention.
[Drawing 8]It is a figure showing the flow chart of the measure resistance device measuring process in the measurement executive operation in the 1 embodiment of this invention.
[Drawing 9]It is a figure showing the flow chart of the analog measuring process in the measure resistance device measuring process in the 1 embodiment of this invention.
[Drawing 10]It is a figure showing the proper range to the resistance measurement in the ranging machine 11 in the 1 embodiment of this invention.
[Description of Notations]
1 Measure resistance device
2 WS
3 Control circuit

31 CPU
32 I/O
33 Memory
4 Testing circuit
5 Calibration circuit
6 Transmission line
7 Measuring resistance
8 Constant current source circuit
9 Differential amplifier
10 Low pass filter
11 Ranging machine
111 Amplifier

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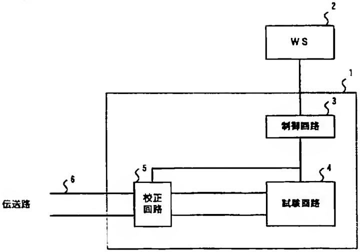
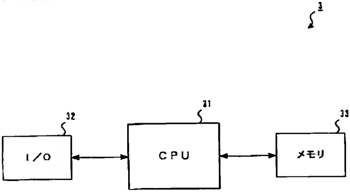
DRAWINGS

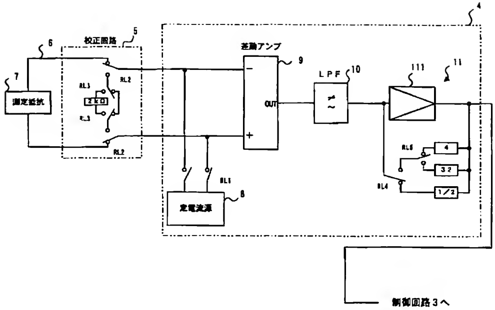
[Drawing 1]



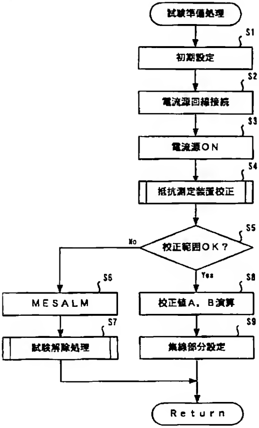
[Drawing 2]



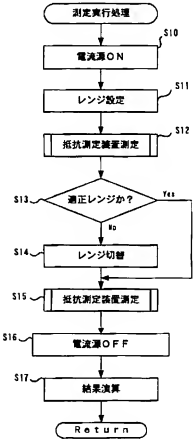
[Drawing 3]



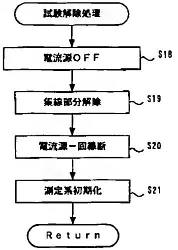
[Drawing 4]



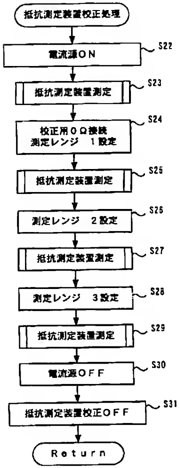
[Drawing 5]



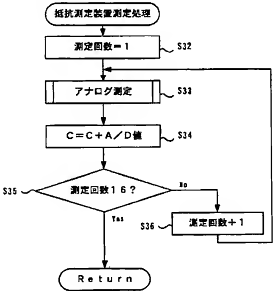
[Drawing 6]



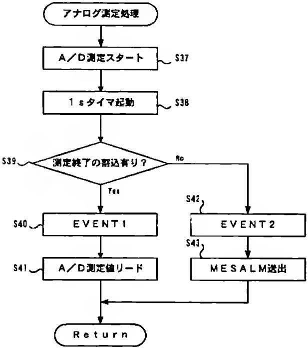
[Drawing 7]



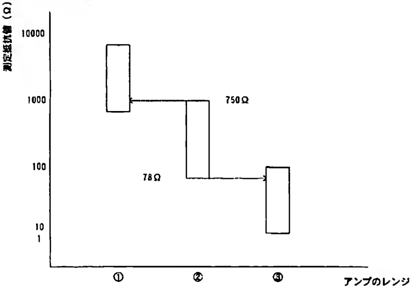
[Drawing 8]



[Drawing 9]



[Drawing 10]



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